









EVALUATING INTERNATIONAL PROJECTS --  
AN ADJUSTED PRESENT VALUE APPROACH\*

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## I. INTRODUCTION

In evaluating projects that cut across national boundaries, firms must deal with a variety of issues seldom encountered within a single country that affect the distribution of net operating cash flows available to the parent as well as the valuation of these cash flows.<sup>1/</sup> Factors influencing the statistical distribution of net operating cash flows, in addition to differences in fundamental economic and political conditions in various countries, include differing rates of inflation and volatile exchange rates that may or may not cancel each other, differences in tax rules and tax rates, and restrictions or taxes on cross-border financial transactions. Factors that may influence the valuation of operating cash flows with a given statistical distribution include incomplete and often segmented capital markets that result from controls on financial transactions both within and among countries, the dependence of net of tax cash flows available to the parent on the firm's overall tax and cash flow position in various countries, the availability of project specific concessional finance -- loans, guarantees, or insurance against commercial or political risks, and, on occasion, requirements to issue securities--especially equity--within markets partially or totally isolated by barriers to internal or cross-border financial transactions. Further, the available cash flows and their value to the firm often depend on the specific financing of the project, not only because of concessional financing opportunities, but also because the costs or limits on cross-border transfers often depend on the nature of the financial transaction involved, e.g. interest or principal, fees, dividends,

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<sup>1/</sup> See Eiteman and Stonehill [1979], Rodriguez and Carter [1979], Shapiro [1978a] and Folks [1979] for summaries of the factors distinguishing domestic and foreign projects. An early paper that raised most of these questions was Stonehill and Nathanson [1968].

or payment for goods.

As a result of these various factors, it is often necessary to distinguish project and parent cash flows, to recognize interactions between the financing and valuation of a project, to take into account dependencies between project valuation and the corporation's overall tax and cash flow situation, and to incorporate in the valuation criterion the perspectives of multiple investors not sharing a common capital market. Thus traditional weighted average cost of capital rules that implicitly separate investment and financing decisions often are inapplicable or misleading<sup>2/</sup> as well as exceedingly complex.<sup>3/</sup> A variety of alternative approaches have been put forward,<sup>4/</sup> some involving multiple investment criteria<sup>5/</sup>, others requiring the consideration of the "full-system" effects of the project in question,<sup>6/</sup> and others providing relatively complex criteria reflecting the existence of multiple investors

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2/ Rodriguez and Carter [1979] demonstrate how weighted average measures using project or subsidiary capital structures are misleading when there is financial "layering" within the corporation.

3/ Shapiro [1978 b] provides a detailed derivation of a weighted average rule for international projects that take many of these factors into account. However, it is exceedingly complex and resulting hurdle rate is likely to differ across projects and over time.

4/ Naumann-Etiene [1974] provides a good review of the early literature on this topic.

5/ Eiteman and Stonehill [1973] suggested a dual hurdle rate approach. Although they have dropped it in their subsequent edition, it continues to be advocated by others.

6/ See for example, Pomper [1976].

based in less than fully integrated capital markets.<sup>7/</sup>

This paper seeks to show that an adjusted present value approach (APV), based on the value additivity principle (VAP) that holds for independent projects in complete capital markets, provides a relatively simple framework for evaluating most international projects consistent with state of the art financial practice. It is restricted to projects wholly-owned by the parent or whose equity is shared by investors having access to the same relatively complete capital markets. It does not address the valuation of projects by joint ventures where equity is shared by investors based in markets segmented by barriers<sup>8/</sup> or the relative valuation of particular projects by firms based in countries with relatively complete markets and by local firms operating in a more restricted capital market -- a potential motivation for direct foreign investment.<sup>9/</sup>

<sup>7/</sup> Adler [1974] provides the most complete treatment of this issue.

<sup>8/</sup> See Adler [1974] and Adler and Dumas [1977] for a discussion of valuation in such cases. Although the APV from the viewpoint of a single investor will not, in general be the appropriate investment criterion for the joint venture, it will be appropriate for valuing that project from the single investor's viewpoint. In practice, there may be no rule that satisfies both participants in the joint venture. In such cases, project acceptance depends on bargaining among the participants, where each may use an APV measure to evaluate their share.

<sup>9/</sup> See, for example, Adler and Dumas [1975, 1977], Agmon and Lessard [1978], and Stapleton and Subrahmanyam [1977].

Special attention is given to the valuation of operating cash flows that are not denominated in any specific currency but reflect the interaction of inflation rates and exchange rates and of nominal cash flows such as depreciation tax shields and debt service that are contractually denominated in a specified currency.

The paper is organized in six sections. Section II describes the APV approach and discusses the circumstances under which it is applicable. Section III discusses the valuation of operating and contractual cash flows. Section IV presents a general APV formula for foreign projects that distinguishes between operating and contractual cash flows and takes into account the effects of differing tax systems, exchange and credit restrictions, and concessional financing opportunities together with their interactions with the structure of the project's cross-border interaffiliate financing as well as with the local subsidiary and parent firm's external financing. Section V discusses briefly the risk premia applicable to the various cash flows and Section VI discusses the implementation of the APV approach, especially with regard to approaches involving multiple cash flow estimates and simulation.

## II. THE ADJUSTED PRESENT VALUE APPROACH

As a result of the "cost of capital revolution" of the 1960's, the dominant approach to project evaluation is to discount expected after-tax project cash flows by a weighted average cost of capital,

$$NPV = \sum_{t=0}^T \frac{\overline{CF}_t}{(1+\rho^*)^t} \quad (1)$$

where NPV is net present value,  $\overline{CF}_t$  is the expected total after tax project cash flow in period  $t$ , and  $\rho^*$  is the weighted average cost of capital.

$\rho^*$ , in turn is usually defined as:

$$\rho^* = (1 - \lambda)\rho^E + \lambda r(1 - \tau) \quad (2)$$

where  $\lambda$  is the weight of debt in the total capital structure,  $r$  is the pre-tax interest rate on debt,  $\tau$  is the corporate tax rate, and  $\rho^E$  is the required rate of return on equity.

The advantage of the traditional approach is its simplicity. It imbeds in a single discount rate all financing considerations, thus enabling planners to focus on the project's investment characteristics. However, different discount rates are required for projects that differ from a firm's typical project in terms of either business risk or contribution to debt capacity and equation (2) provides little guidance since  $\rho^E$  will be changed by an unspecified amount. Both conditions are the rule rather than the exception for foreign projects. Further, when the financing complications of foreign projects are introduced, the weighted average approach becomes complex and cumbersome, removing its major advantage. In fact, when financing sources for foreign projects include limited amounts of restricted funds or project-specific concessionary credit, there will be different weighted average costs for projects that differ only in scale.

With capital structures that vary over time -- which is typical of projects financed independently of the parent to minimize taxes, take advantage of project-specific financing subsidies, or minimize political risks -- a different weighted average will be required in different years of the project's life.

Differences in project debt capacity can be incorporated via the alternative weighted average formula developed by Modigliani and Miller [ ]:

$$\rho^* = \rho[1 - \tau\lambda] \quad (3)$$

where  $\rho$  is the "all equity" required rate of return reflecting the project's business risk. Further, it can be generalized to situations where business risk differs as well. The project required rate of return,  $\rho_j^*$ , is given by:

$$\rho_j^* = [r + \beta_j(\rho_m - r)] [1 - \tau\lambda] \quad (4)$$

where  $\beta_j$  is the project's beta coefficient (adjusted to remove the effect of leverage) and  $(\rho_m - r)$  is the risk premium on the market portfolio.

As noted by Myers [1974], however, formulas (2) and (4) are exactly correct only if the cash flows are perpetual and  $\lambda$  is constant over time. In many cases where projects are financed from a common corporate pool the errors are not serious. However, if the financial structures of specific foreign projects differ from those of the parent firm or vary over the project lives because of the availability of concessional finance,

political or currency risks, even the generalized formula (4) is likely to be misleading.

To deal with the problem, Myers [1974] suggests a return to the basic Modigliani - Miller equation underlying (3). Rather than implicitly incorporating financial factors in  $\rho^*$ , the approach values them explicitly in an adjusted present value equation:

$$APV = \sum_{t=0}^T \frac{\overline{CF}_t}{(1+\rho_j)^t} + \sum_{t=0}^T \frac{TS_t}{(1+r)^t} \quad (5)$$

where the first term is the present value of the total expected operating cash flows discounted by  $\rho_j$ , the "all equity" discount rate reflecting the project's business risk, and the second term is the present value of the tax shields arising from debt, discounted at the before tax cost of debt,  $r$ . This is a direct

application of the value additivity principle (VAP) -- that in equilibrium the market value of any set of "risk independent" cash flows available for distribution to security holders (after corporate taxes) is equal to the sum of the values of the individual components.<sup>10/</sup>

#### Applicability of VAP to International Projects

Value additivity is a robust concept. Haley and Schall [1979, pp.230-237], show that it applies without exception for securities (claims to income streams) issued in complete, competitive capital markets with neutral personal taxes. Further, they argue that because of clientele effects, VAP will hold in general for individual firms even if personal taxes are not neutral in their treatment of interest, dividend, and capital gain income. Most importantly, they point out that even if markets are not complete, i.e. that there is no perfect substitute for one or more of the income streams provided by the firm or project, the potential for investor arbitrage will generally maintain value additivity. It breaks down when certain transactions are restricted or costly and, as a result the potential for investor arbitrage is impaired.

At first glance, this latter condition appears to rule out VAP for projects with income streams subject to cross-border costs or restrictions or to

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<sup>10/</sup> The VAP, an extension of the first Miller-Modigliani proposition, was introduced by Schall [1972] and, although not given the same name, by Myers [1968]. For an excellent statement, see Haley and Schall [1979, pp. 202-208].

projects in countries with capital markets isolated by such barriers. However, VAP requires only that investors can engage in arbitrage among the various income streams available for distribution by the parent firm after corporate taxes. Thus any restrictions or taxes on cross-border transfers to the parent must be reflected in the income stream components, but will not affect the ability to combine or divide these remittable, net of corporate tax streams for valuation.

The fact that local capital markets are not competitive because of internal controls or lack of the necessary institutional infrastructure or are isolated from other markets by barriers to cross-border transactions is irrelevant in the valuation of projects by wholly owned ventures in such countries by firms based in countries with relatively open, competitive capital markets. These conditions may change the investment opportunity set facing the firm through their impact on the competition for projects resulting from differences in project valuation by local and international firms, but the appropriate context for the valuation of these flows is the base country capital market. Even in the case of joint ventures, these conditions will have no effect on the valuation of a given set of income streams by the international firm, although they may lead to different valuation criteria for the local firm, and hence lack of agreement between the participants regarding investment and financing decisions.<sup>11/</sup>

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11/ In practice, virtually all international ventures can be considered joint ventures in the sense that the local government's income taxes are risky equity claims and locally-issued debt typically carries some project-related risks. In these cases, the local government's valuation of a venture may differ from that of the international firm, but these effects will usually be swamped by other adjustments such as shadow prices for foreign exchange and labor and the recognition of positive and negative externalities.

### III. RECOGNITION OF INFLATION AND EXCHANGE RATE CHANGES

An individual international project may involve cash flows in several different currencies, some proportion of which will be contractually denominated in those currencies and the remainder of which will be determined by the interactions of future business conditions, and changes in relative prices, price levels and exchange rates. These flows can be viewed from four different perspectives as illustrated in Figure 1: either in the base currency or the local currency and either in current or constant terms. The only critical requirement for correct valuation is that the discount rates used are consistent with the way the cash flows are stated, i.e. if current values are used, the discount rates must incorporate the relevant inflation premiums, if constant, the discount rates should not include inflation premiums.

		Treatment of Inflation	
		constant	current
Currency	local	I	II
	base	III	IV

Figure 1

### Alternative Cash Flow Perspectives

Common practice in estimating and evaluating cash flows can be characterized as follows. Firms first project expected revenues and expenses in constant terms, linking present unit costs and revenues with future unit sales projections. These flows are transformed into current terms by inflating them at the anticipated general rate of inflation. If the flows are not already

stated in the base currency, they then are translated into current base currency units using projected exchange rates. This process involves moving from quadrant I in Figure I to quadrant II and then to quadrant IV. Although there is nothing necessarily incorrect with this approach, it often is applied inconsistently and important interdependencies between inflation and exchange rates and their impacts on operating and contractual cash flows are often overlooked. Further, it is difficult to extend this approach to accommodate a range of operating cash flow estimates consistent with various economic scenarios or to cash flow estimates generated by simulation. Each scenario must incorporate explicit assumptions regarding inflation rates, exchange rates, and cash flows while a simulation requires the joint distribution of the three sets of variables.

The basis for a simpler, yet more transparent approach is provided by the set of equilibrium relationships between interest rates, rates of inflation, and changes in exchange rates that (tend to) hold in efficient markets -- purchasing power parity and the (domestic and international) Fisher effect. <sup>12/</sup> Even when these relationships do not hold precisely, they serve to highlight the impact on cash flows of the interactions between inflation and exchange rates and provide insights regarding the valuation of these flows.

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<sup>12/</sup> For a succinct definition of these relationships, see Frenkel [1976], Giddy [1977] and Solnik [1978]. See Dornbusch [1979] for a more complete discussion of the underlying economic theory.

It is useful to separate cash flows into two groups: (1) operating cash flows which are not contractually denominated in nominal terms and whose value in constant terms is relatively independent of inflation and (2) contractual flows denominated in a particular currency whose value in current terms is relatively independent of inflation. A different treatment is appropriate for each of the two classes of flows.

#### Operating Cash Flows

The home currency value of operating cash flows in another currency is given by

$$V = \sum_{t=1}^T \frac{\overline{CF} \text{ (current)}_t * \overline{S}_t}{(1 + \rho)^t} = \sum_{t=1}^T \frac{\overline{CF} \text{ (constant)}_t (1 + \overline{I})^t * \overline{S}_t}{(1 + \rho)^t} \quad (6)$$

where  $\overline{CF}$  (current) are the expected cash flows in current local terms and  $\overline{CF}$  (constant) are the expected flows in constant terms, and  $\rho$  is the all-equity rate appropriate for flows in the home currency with the project's risk.

This formula can be simplified substantially if the two key equilibrium relationships -- purchasing power parity (PPP) and the Fisher effect (IFE) -- are assumed to hold.<sup>13/</sup> PPP implies that exchange rate changes and relative

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<sup>13/</sup> For an excellent review of the theory and evidence regarding purchasing power parity, see Officer [1976]. Levich [1979] reviews the evidence regarding the degree to which the forward rate is an unbiased predictor of future spot exchange rates and of interest rate parity, conditions that jointly imply IFE.

rates of inflation offset each other. As a result, the spot exchange rate for foreign currency (stated in terms of units of the base currency per unit of foreign currency) at time  $t$  is

$$\bar{S}_t = S_o (1 + \bar{I})^t / (1 + \bar{I}^*)^t \quad (7)$$

where  $S_o$  is the current spot rate,  $I$  the base currency inflation rate, and  $I^*$  the foreign currency inflation rate.<sup>14/15/</sup> IFE implies that the nominal riskless interest rate,  $r$ , for a given currency, incorporates a premium for anticipated inflation. Thus  $(1 + \rho)$  can be restated as

$$(1 + r_{real}) (1 + \bar{I}) (1 + RP) \quad (8)$$

when  $r_{real}$  is the real interest rate and RP is the risk premium.

Substituting into (6)<sup>16/</sup>

$$V = \sum_{t=1}^T \frac{\bar{C}F \text{ (constant)}_t (1+\bar{I}^*)^t S_o (1+\bar{I})^t / (1+\bar{I}^*)^t}{[(1+\rho_{real}) (1+I)]^t} \quad (9a)$$

$$= S_o \sum_{t=1}^T \frac{\bar{C}F \text{ (constant)}_t}{(1+\rho_{real})} \quad (9b)$$

14/

The classical PPP relationship is defined in terms of certain, contemporaneous variables. Giddy [1976] and Solnik [1978] discuss the expectational form.

15/

This formula can be altered readily to accommodate varying rates of inflation over time.

16/

If PPP does not hold exactly, equation (9a) includes the covariances among cash flows, inflation, and exchange rates and does not reduce to (9b). However, if the cash flows in constant terms are (relatively) independent of inflation and the exchange rate, the approximation is satisfactory.

The problem of cash flows in different currencies and discount rates appropriate for each one collapses into a single currency calculation where the current exchange rate simply scales the flows to a common base.

Departures from PPP and IFE: Of course, PPP does not hold exactly and interest rates do not provide exact guides to future exchange rate changes. However, there is little evidence for major currencies subject to market forces that deviations from these key relationships are persistent or that they can be forecast.<sup>17/</sup> As a result, the simplified approach to cash flow estimation and valuation based on these equilibrium tendencies is quite robust for single-point, expected cash flow estimates. If various distributions of cash flows are considered, the problem becomes more complex. Ex post deviations from IFE will have no effect on valuation if PPP continues to hold. However, departures from PPP are likely to alter cash flows stated in constant local terms as well as the real exchange rate at which they can be converted into the base currency. This is because they result in changes in the relative prices of inputs or outputs sold or sourced in different countries. Further, the deviations themselves are likely to reflect changes in relative prices within countries, with important implications for cash flows.

It is much more likely that firms can forecast trends in relative prices of certain inputs and outputs as opposed to overall deviations from PPP since relative price changes hinge on micro-level changes in productivity, scarcity, or substitutability

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<sup>17/</sup> Roll [1979], for example, finds no evidence that deviations from PPP persist or can be forecast.

of the good or factor in question. Furthermore, given the evidence that PPP holds quite well over the long run, these relative price shifts are likely to result in larger impacts on project values than divergences from PPP. These relative price shifts can be incorporated readily by changing project cash flows in either (9a) or (9b), but (9b) is more transparent since it abstracts from offsetting inflation and exchange rate changes.

Where exchange rates are forecast to diverge from PPP because of exchange controls or trade barriers, explicit joint estimates of the local currency cash flows and exchange rates are required. These can be stated in either real or nominal terms since the key element is the change in the real exchange rate (deviation from PPP) and not the absolute exchange rate and level of inflation. Typically, the impact of PPP deviations in such cases will not be symmetric, since price controls or other market interventions are likely to be systematically related to the PPP departures.

#### Contractual Cash Flows

Contractual nominal cash flows including interest on debt and tax rebates based on historical cost depreciation can be discounted at a nominal rate appropriate to the currency in question and converted to the base currency by multiplying the resulting present value by the current spot rate,

$$V = S_o \sum_{t=1}^T \frac{\overline{CF} \text{ (current)}_t}{[(1+r) (1+RP)]^t} \quad (10)$$

where  $(1+r) = (1+r_{\text{real}})(1+I)$  and I is for the currency in which the flows are denominated.<sup>18/</sup>

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18/ The value of riskless contractual flows is unaffected by uncertainty regarding the exchange rate since it can be locked in by borrowing or lending an equivalent flow at the nominal market interest rate.

For major currencies, where interest rate parity and the Fisher effect tend to hold, market interest rates are appropriate. Where market interest rates do not reflect generally-held inflation and exchange rate expectations as a result of credit controls or exchange restrictions, an offshore rate (if available) or an estimated rate must be used.

Deviations from IFE: Any unanticipated change in exchange rates, whether it represents a departure from PPP or not, changes the present value of contractual flows. Anticipated changes reflected in interest rates will have no effect on interest bearing contractual claims, but will change the value of non-interest bearing claims such as depreciation and other tax shields based on historical cost allocations.

#### IV. APPLYING APV TO FOREIGN PROJECTS

The APV approach, outlined in Section II provides a "divide and conquer" approach to capital budgeting. Financial contributions to a project's value are recognized separately and explicitly, the total present value is the sum of the present values of the basic project cash flows and the treatment of the various financing effects can be generalized to incorporate the special situations encountered in evaluating foreign projects. In particular, the cash flows can be separated into operating and contractual components as well as into those components that can be estimated independently for the project and those that depend on system-wide cash flow and tax interactions. This breakdown is illustrated in the following general equation:

Adjusted Present Value APV (11)

$$\begin{aligned}
 & \text{non-contractual operating flows} \left\{ \begin{aligned}
 & \text{Capital Outlay} = \sum_{i=1}^N s_o^i \sum_{t=0}^T \frac{I_t^i}{(1+\rho_1)^t} \\
 & + \\
 & \text{Remittable After-Tax Operating Cash Flows} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\bar{C}_t^i (1-\tau)}{(1+\rho_2)^t} \\
 & +
 \end{aligned} \right. \quad (11a) \\
 & \left. \begin{aligned}
 & \text{Contractual Operating Flows} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\text{CONT}_t^i (1-\tau)}{(1+\rho_3)^t} \\
 & + \\
 & \text{Depreciation Tax Shields} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\text{DEF}_t^i(\tau)}{(1+\rho_4)^t} \\
 & + \\
 & \text{Tax Shields Due to Normal Borrowing} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\text{INT}_t^i(\tau)}{(1+\rho_5)^t} \\
 & + \\
 & \text{Financial Subsidies or Penalties} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\Delta \text{INT}_t^i}{(1+\rho_6)^t} \\
 & + \\
 & \text{Tax Reduction or Deferral via Interaffiliate Transfers} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\text{TR}_t^i}{(1+\rho_7)^t} \\
 & + \\
 & \text{Additional Remittances via Interaffiliate Transfers} = \sum_{i=1}^N s_o^i \sum_{t=1}^T \frac{\text{REM}_t^i}{(1+\rho_8)^t}
 \end{aligned} \right. \quad (11b) \\
 & \text{contractual flows} \\
 & \text{operating flows dependent on firm's overall tax and cash flow position}
 \end{aligned}$$

where superscript  $i$  denotes currency  $i$ , and  $s_o^i$  is the current spot rate for currency  $i$ .

Each of the terms is discussed in greater detail below. We assume that operating flows are stated in constant terms and hence discounted at a real rate, while the contractual flows are stated in current terms and, hence, are discounted at the relevant nominal rate. Appropriate risk premiums for the various components are discussed in section V below.

Capital Outlay (11a): The elements of this term are unambiguous for items purchased by the firm, but more complex for capital items sourced internally. The major obstacle in the latter case is calculating the true incremental cost to the system, which may differ substantially from the registered book value of the item in question. Contractual capital costs should be distinguished from non-contractual costs and discounted at nominal rates.

Capital expenditures often are paid out of accumulated funds from existing operations whose use is restricted by exchange controls or because special tax advantages will be forfeited or additional U. S. taxes imposed if the funds are remitted rather than reinvested. The APV framework lends itself readily to incorporating the incremental value of a project resulting from its ability to employ such funds. Since the operating cash flow term already captures project cash flows that will be available for remittance, taxed as if they are remitted, the use of restricted funds simply reduces the investment outlays (11a) by the difference between their face value and the present value of these funds if remitted via the best alternative mechanism.

Operating Cash Flow (11b): In the domestic case, there is little difficulty in defining after tax operating cash flows. They are the total project cash flows less U.S. taxes. Whether they are reinvested in the project or not makes no difference, since all flows are deemed available to the corporate cash pool. With foreign projects, there are two major issues in defining operating cash flows:(1) whether to use project cash flows or only those flows remitted to the parent and(2) what taxes to assume, since these will be a function of financing and remittance decisions. The first distinction arises because of foreign exchange restrictions and ceilings on profit remittances; the second because of the interactions of various national tax systems.

Clearly, the only cash flows of value to the parent are those available for remittance in one form or another, not necessarily those actually remitted. Furthermore, after-tax flows must take into account the incremental taxes to the entire corporation. However, the specific choice of ways to deal with the two issues is a question of managerial art--the solution should be straightforward, easy to apply, and likely to bring to management's attention the most critical issues.

There are two basic approaches. One is to begin with the most favorable set of assumptions regarding taxation and remittability and, in later terms of the APV equation, subtract the present values of reductions due to specific restrictions or international tax interactions. The other is to start with conservative assumptions regarding remittability and taxation, later adding the present value of gains resulting from various mechanisms for circumventing restrictions or deferring taxes. I prefer the second alternative for the pragmatic reason that if a project is attractive under conservative assumptions there is no need to proceed with the far more complex set of

calculations regarding tax and remittance adjustments that require consideration of the total corporate cash flow and tax situation.<sup>19/</sup>

The conservative approach includes in the first term only those cash flows available for remittance through normal channels, for example amortization of investment and repatriation of earnings -- but not those that can be obtained only through transfer pricing or other mechanisms for circumventing restrictions. The tax rate applied to these flows is either the parent rate or the foreign rate, whichever tax system imposes the largest tax liability. This implicitly assumes that all operating cash flows are remitted immediately to the United States and that the parent has no excess foreign tax credits. Any additional value derived by circumventing restrictions on cash remittances, deferring U.S. taxes, or offsetting excess foreign tax credits can be incorporated in additional terms. Since depreciation tax shields are captured in a separate term, after-tax cash flows are simply pre-tax flows multiplied by one minus the relevant tax rate.

A further and perhaps more serious issue in the computation of operating cash flows is the difficulty of measuring the true incremental cash flows of a project in an interdependent multinational system. For example, the establishment of a manufacturing plant in a country previously served by exports will result in an erosion of profits elsewhere in the system, but may also create new profit opportunities for other parts of the system that provide intermediate or complementary products. This difficulty is exacerbated by departures from arm's length transfer pricing among units some of which may result from conscious manipulation of tax and exchange control systems but most of which result from the near impossibility

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<sup>19/</sup> This assumption is analogous to the "default value" approach suggested by Folks [1979].

of allocating the joint costs and benefits associated with "soft" factors of production such as technology and managerial expertise used by more than one unit of the corporation. Clearly, an attempt should be made to measure incremental cash flows to the total system. Further, in keeping with conservative tax and remittance assumptions, interaffiliate flows should be valued as closely to an arm's length value as possible.<sup>20/</sup>

Contractual Operating Flows (11c): Some elements of operating costs or revenues, as well as capital costs, may be set contractually. Typically, this will be true only for a relatively short period and, thus, the distinction is immaterial for capital budgeting. However, where long-term sourcing or sales contracts are involved, explicit recognition of the contractual cash flows is called for.<sup>21/</sup>

Depreciation Tax Shields (11d): This contractual cash flow is deterministic, subject to the corporation's ability to use or sell the tax shield, given investment outlays. The relevant tax rate and set of tax rules that should be used are those binding at the margin as noted above.

Interest Tax Shields (11e): For a variety of reasons, including the availability of concessionary credit, the existence of tax or exchange considerations that favor remittances in the form of interest payments, and the desire to hedge currency or political risks, foreign projects are often

20/ Vernon and Wells [1976] and Robbins and Stobaugh [1973] provide further illustration of the difficulty of measuring incremental cash flows at a system level.

21/ See Lessard [1979, pp. 354-356] for a discussion of contractual and non-contractual cash flows and their implications for corporate exposure to exchange rate changes.

financed with a different and typically higher proportion of debt than the corporation as a whole. Further, the debt issued to finance the project often exceeds the increment to overall debt capacity provided by the project. Thus, approaches that directly utilize the project capital structure in computing a weighted average cost of capital are likely to overstate the worth of the project, but a weighted average based on the total firm's capitalization also is likely to be misleading. In the APV equation, in contrast, the second term captures the tax shields associated with a project's incremental contribution to corporate debt capacity. The costs or benefits of "overborrowing" at the project level for reasons of currency risk, concessionary credit, or remittance restrictions are treated explicitly in later terms.

Financial Subsidies or Penalties (11f): The value of subsidies in the form of concessionary credit or penalties resulting from local financing requirements can be computed by comparing the present value of the total pretax payments on the debt, including interest and principal, discounted at the rate that would apply if the same debt were issued to competitive capital markets with the face value of the debt. For example, if a project is eligible for a concessionary loan at 6 percent instead of a market rate of, say, 9 percent, (11f) would be the difference between the present value of the total pre-tax payments on the 6 percent debt discounted at 9 percent and the face value of the debt.<sup>22/</sup>

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22/ Pre-tax cash flows are used since it is assumed that the use of concessionary debt will require a matching reduction in other corporate borrowings. Thus the additional interest tax shields of the concessionary debt will be offset by reduced interest tax shields on corporate borrowing at market rates. The tax shields gained and lost will not match exactly if debt capacity is defined in terms of book values. Even if defined in terms of (net present value of) cash flows, the offset will be inexact since the proportion of the debt service flows that is interest will differ for the concessionary debt and borrowings at the market rate with the same present value. In most cases, however, the error is small.

Ability to Reduce or Defer Taxes (11g): The base case operating cash flows, term (11b) incorporate conservative assumptions regarding the taxation of project cash flows--that they will be taxed at the U.S. rate or the local rate in the foreign country, whichever results in the greater tax liability. In many cases an MNC can reduce taxes from this level by combining profits from countries with relatively low and high taxes, by shifting expenses and revenues among its affiliates, or simply by reinvesting profits in low tax countries and deferring the additional U.S. taxes. In principle, the present value of these tax changes can be readily incorporated in an APV term, although computing them may require a complex corporate tax model. However, reversing the analysis to calculate a "breakeven" value for term (11g) may show that a readily attainable degree of tax reduction is all that is required. Thus the full analysis can be avoided.

Ability to Circumvent Restrictions on Remittances (11h): The base case operating flows, term (11b) include only those operating flows available for remittance. Thus, they will be less than project flows whenever there are binding remittance restrictions. In many cases, however, the restricted flows can be transferred out through interaffiliate pricing, management fees, special export programs, or other mechanisms. The value of these remittances, typically less than the face value of the funds in question, can be incorporated

in another APV term. Again, a major advantage of the "divide and conquer" approach is that it makes explicit the impact on project value of remittance restrictions and alternative ways around them. Even where the exact possibilities for transferring restricted funds are not known, a "breakeven" value for term (11h) can be computed, thus showing what proportion, in present value terms, of the restricted profits would have to be transferred to make the project marginally attractive.

#### V. RISK PREMIUMS FOR FOREIGN PROJECTS

Although the APV approach does not require that the effects of financial structure be reflected in the discount rate, the discount rate for each term must reflect both the rate of interest (real in the case of operating flows, nominal in the case of nominal flows) and a risk premium. According to current capital market theory, this risk premium should reflect only the systematic risk of the project. Depending on the openness of the base country capital market, this systematic risk should be measured relative to the firm's home country market portfolio or relative to the world market portfolio. As shown by Lessard (1976), the systematic risk of

projects in various countries differ substantially from U.S. and world perspectives, but much more so for other single-country versus world perspectives. From a single-country perspective, foreign projects will tend to have less systematic risk than domestic projects, although this may not be true if the more appropriate world base is used. In countries where local conditions are extremely uncertain, but not highly dependent on the world economy, the total risk of the project will be substantially greater than its systematic risk from any perspective other than the local one. Thus, even apparently risky projects may not require greater than normal risk premiums

The suggestion that cash flows from projects in politically unstable countries should not require large risk premiums is at odds with general practice. Many firms attach large risk premiums to such projects. However, the difference is often more semantic than real. A common approach to evaluating foreign projects is to discount most likely (modal) rather than expected (mean) cash flows at a risk-adjusted rate. For projects with a significant risk of expropriation or large losses due to changes in the economic structure of a country, the mean will be substantially lower than the mode. Thus the discount rate is being used to shift cash flows toward their expected values as to discount them by a risk premium. Such "risk adjustments," though, introduce biases and the more explicit approach that captures the effect of risks on expected cash flows as well as on their valuation is preferable.<sup>23/</sup>

Appropriate discount rates for each major category of the APV terms are discussed below.

Non-contractual Flows ( $\rho_1$  and  $\rho_2$ ): Capital Outlays Since these flows are not contractually fixed in any currency, but vary depending on the interactions of inflation and exchange rates as well as a host of other factors, I have argued that they should be stated in terms of units of constant purchasing power and discounted at the real rate of interest plus a risk premium reflecting their systematic risk. However, determining this systematic risk represents a major challenge.

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<sup>23/</sup> Eiteman and Stonehill [1979] follow a third approach, "adjusting" cash flows until they are of equivalent risk to those of domestic projects and then discounting them by the domestic "cost of capital." This is similar to taking certainty equivalents of cash flows and discounting them by the riskless rate. While in many ways it is theoretically more appealing than to discount expected cash flows by a risk-adjusted rate, there are no operational yet reasonably precise ways to do this.

In many cases there are no host country firms in the same industry with shares traded in an active market to provide  $\beta$  estimates. Furthermore, formal or informal approaches for estimating fundamental  $\beta$ 's are likely to be hampered by a lack of experience with similar projects. In addition,  $\beta$  estimates estimated empirically will relate the volatility of equity values, reflecting both operating and contractual cash flows. Hence it is necessary to "back out" the relevant  $\beta$ 's for the various components. This is not an insurmountable task, though, since the contractual flows are relatively safe and can be assumed to be discounted at a rate close to the riskless rate. Thus, the adjustment involves "unlevering"  $\beta$  not only for financial leverage but also for depreciation tax shields.

Contractual Flows ( $\rho_3 - \rho_6$ ): The critical element is discounting these flows is determining the appropriate nominal interest rate for (near) riskless debt. Undoubtedly there is some risk of default associated with the various contractual flows and hence a risk premium may be required. Nevertheless, as a first approximation, the corporation's borrowing rates in unregulated markets can be used. Technically, the depreciation tax shields are subject only to the risk that the firm cannot make use of them. This may be serious in certain cases, but in general if the firm cannot take the deductions directly it can carry them forward or backward in time or in the ultimate case, transfer them to another firm through mergers. Roughly speaking, then,  $\rho_4$  will involve only a small risk premium and can be approximated by the interest rate on the firm's debt in the currency in question. Similar arguments apply to interest tax shields and financial subsidies.

System dependent operating flows ( $\rho_7$  and  $\rho_8$ ):

Although part of these flows are tax savings due to transfer pricing or earnings retention decisions, they are not contractually denominated except to the extent that the profit shifting also changes depreciation tax shields. Thus in practice it might be necessary to separate the term into an operating and contractual component, with the appropriate inflation and risk adjustments for each element. The amount available for remittance through these channels will depend directly on project operating cash flows and thus, although the risks of being able to remit these additional funds are unlikely to be highly systematic, the discount rate applicable to operating flows,  $\rho_2$ , appears to be a reasonable choice.

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VI. SUMMARY AND CONCLUSIONS

The APV approach provides a generalized framework capable of incorporating most of the special financial considerations that arise in evaluating foreign projects. Its attractiveness vis-a-vis traditional approaches, which attempt to force all of these factors into a single term, rests only in part on its conceptual superiority. Much of its attraction lies in its transparency and simplicity of use in certain situations.

In practice, capital budgeting involves a great deal of trial and error with various "what if" questions. Furthermore many uncertain outcomes are never reduced to specific cash flows but instead are dealt with by testing the sensitivity of cash flows to changes in a particular assumption and by

judging whether a particular variable is likely to exceed a "breakeven" value. The ability to separate the various terms greatly facilitates such analyses. In most cases, only the operating cash flow streams will need to be run under a variety of scenarios. Similarly, if there is uncertainty with respect to the appropriate discount rates, most of it will center on the risk premium for the operating cash flows, and thus sensitivity analysis can concentrate on these flows. The distinction between real and nominal flows allows a substantially simplified treatment of inflation and exchange rates, but it also serves to highlight the differential impact of these factors on the two types of flows.

While the assumptions of purchasing power parity and interest rate parity undoubtedly break down for certain countries or currencies, they provide the best set of base case single-point estimates. If deviations from these relationships are explicitly considered, a careful attempt to model the effect of these deviations on the cash flows themselves is called for. To treat them as independent in either a scenario or simulation approach is fallacious and is likely to result in more serious errors than assuming that the naive parity conditions hold.

The explicit separation of contractual and non-contractual cash flows in various currencies lends itself to sensitivity or simulation approaches for determining the impact of exchange rate changes on a project's present value, valuable both for capital budgeting and foreign exchange exposure analysis.

While these considerations clearly favor the APV approach, they do not call for its use in all situations. Little will be lost in using a single discount rate that is roughly consistent with APV solutions for small, recurring projects with few or no financing interactions. However, even in this case the APV framework provides the ideal basis for computing these hurdle rates for decentralized use. Any strategic decision that involves financial complexities, though, should be evaluated in the more complete fashion outlined.

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